# ARAR MUSEUM

BIM 3D 4D 5D 6D 7D
20,000 M2 PROJECT
BY 22 MEMBERS
IN 6 WEEKS

**Review Design**
Review the design and model it.

**Time Scheduling**
Planning and scheduling sequence of construction work in the field.

**As Built Model**

**Construction Simulation**
Simulating the progress of the construction work and the cash flow

**Clash detection**
Check geometry conflicts and clashes.

**Cost Estimation**
Calculation cost and producing cash flow.

**Asset Information Model**
Providing the data of FIM stage with a COBie file.

**Drawing package**
Drawings of each discipline to be created for approval.

[Document subtitle]

UTW

ECG Engineering Consultants Group launched the University to Work (UTW) Initiative in April 2010 as in the purpose of integrating the role of universities, private sectors and community institutions in providing the market with a high-quality and efficient vocational education and skills development to induct engineering students , and get them well-qualified for the labor market in accordance with the national Egyptian goals and priorities.

This program aims to bridge the gap between the academic education and the market needs in the field of engineering. This initiative is based on providing group of selected students with technical skills that will help them to acquire the skills required by market needs.

The Program is divided into different phases; Phase one is the recruitment of trainees to the Program, phase two is the technical on the job and professional skills training.

The final stage is the recruitment of the best performing team in ECG.

The ECG cup for the best performing University is also given to the University with the TOP performing teams and the University that will win the cup Consecutive years will keep it forever.

ARAR MUSEUM

## Arar, Saudi Arabia

The museum for the Ministry of Antiquities is located in the town of Arar, Saudi Arabia. The tent-like forms define a series of interconnected galleries through smaller garden spaces. The Arar landscape scheme is based on an abstraction of Arar natural Land and desert formations. The soft roof shapes accommodate a single large enclosed space with a simple and clear internal plan that provides total internal flexibility. The emblematic scheme provides a striking silhouette for Arar and a new cultural landscape. Because of the compact nature of the scheme, the outdoor area is seen as a space for tented outdoor exhibitions or ancillary cultural events.

| Arar Museum | |
|---|---|
| Project Name: | Arar Museum |
| Project Location: | Arar - Saudi Arabia |
| Themes: | Building Information Modeling |
| Project Team: | UTW 10 |
| Project Timescale: | 6 weeks |
| Contract Value: | SAR 100.06m |
| Type of work: | Technical office |

## Stages of BIM and Drivers

**Building Information Modelling** was used in this project and aided specification and was handed over to fabricators to develop for their own use. Its successful application has led to it being applied Further and more extensively in subsequent projects.

The team was assigned by the Information Manager of "Arar Museum" project to conduct a BIM implementation process on the issued design package of the project for construction, being a BIM Supplier to the Contraction Phase of the Project, we're required to review the design and achieve through further building information modeling to perform a full inter-disciplined clash detection and deliver detailed clash reports for design optimization and further deliver a shop drawings package, perform construction simulation, Cost estimation and As Built model to be enriched with all necessary operation and maintenance information to finally deliver an Asset Information Model for facility management purposes. The team uses BIM as an integral part in this simulation for tendering and construction phases and it is even used to help for planning and scheduling the. Internationally, use of BIM is becoming more widespread and it is already a requirement in countries such as Singapore and Denmark. The team primary targets for the project were a high quality of data integration in order to deliver the project deliverables with less waste of time and efforts

GOALS:

Coordination &Clash detection
Review Design
Drawing Package
Time scheduling
Cost estimation
Construction simulation
Asset information model
As Built model

## Engagement

BIM was adopted early in the project as a means of integrating the team enabling intensive collaboration, reducing wasteful processes and improving the flow of information. Over all process map was developed to reach the deliverables within time. The team also found that the BIM aided collaboration as all members of the team were working together from a common file and a common model. Files were shared and coordinated collaboratively using the dropBox using software's included NavisWorks, Revit and another software's and Add-in's were used such as Dynamo, NavisWorks , Sollibri , Robot , Excel , MS.Project, primavera , SOFISTIK , Enscape and Photoshop . This aided a common understanding between team members. The tool was also a useful communication tool for the client as it enabled better visualization for control and progress issues not to mention using it for a marketing wise. The aim of using BIM for collaboration is to assist the parties of the project from the client team and consultant passing through the contractor, and supply chain too and understand the scope of work with the coordinated 3D model and non-graphical data with COBie.

## Software's used in the Project :

**MS Project:** Linking data from Excel and Primavera to NavisWorks

**Enscape:** For Visualization and animation

**Primavera:** Used for collaboration and assigning tasks

**NavisWorks:** Coordination and Clash detection
**Dynamo: Used for automation and repeated tasks**

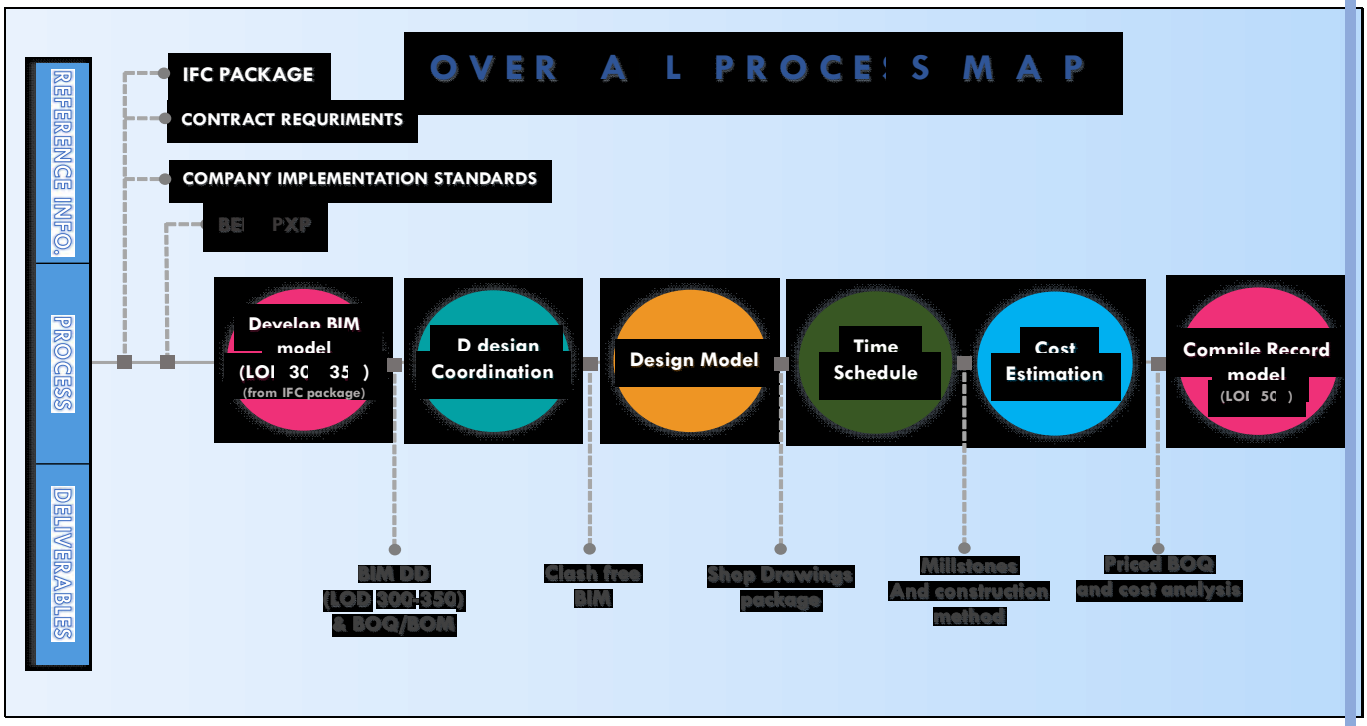
**Revit**: Modeling and sharing the graphical and non graphical data of the project

**Excel:** QTO, Cost sheets, scheduling

**Trello:** Used for collaboration and assigning tasks

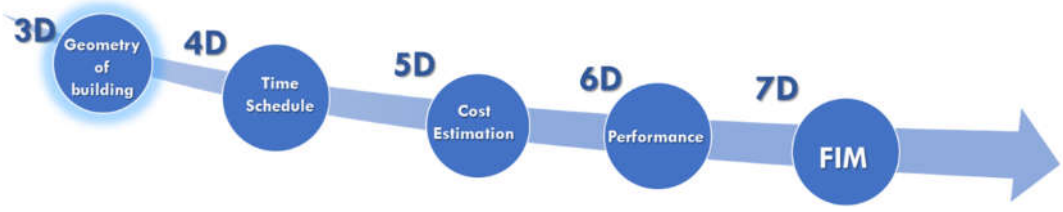
**DropBox:** Publishing , sharing and achieving files

**SketchUp:** Site layout



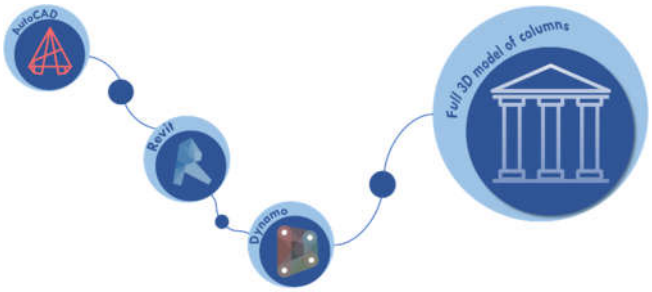
## KPI's

Always The focus of any party is to manage the resources to get the best value of Cost, time and quality of information. A tight timeframe of just 6 weeks  to finish the work within this duration . The information management processes were seen to be greatly enhanced for such timeframe and goals . There are too many examples of optimizing time and efforts are used in this project . An example of this optimizing processes was for 3D modeling which a dynamo script was used to create columns  model by floor on their axis positions and their family types , names , cross sections and material . The building included over 500 columns and + 40 types. The time to be consumed during modeling of all of these columns using this Dynamo script is nothing if compared with traditional method of modeling instance by instance. The direct cost of the surveyed quantities to be directly exported in one formatted excel sheet, using dynamo link between Revit and excel ,even if changes or elements are deleted or created . So that all elements of project to be priced once created in the Revit file. This saves 70% of effort , time and more important accurate with minimum mistakes 0to achieve 4D and 5D outputs compared to traditional methods . Additionally, the project has enabled better engagement with Clients by helping them to understand BIM and 'pushing' the demand side to be more explicit with their requirements and understanding how to articulate objectives more coherently.




Modeling of an element for several times takes is the traditional method of

modeling. In this project as mentioned
before number of columns exceeded
+500 column with a different types.
Detecting and creating each type with its
prosperities  on position and orientation one by one
will consume much of time and effort not to mention
factor of error during modeling and data validation.
A Dynamo graph was used to create , detect and model
each instance according to it's type , on position with the right
orientation. This made the next processes and stages delivered
faster
 , specially during the coordination no repeated work to be
done , all this is done by one click.




## 3D COLUMN STATISTICS

90% TIME SAVED

90% EFFORT SAVED

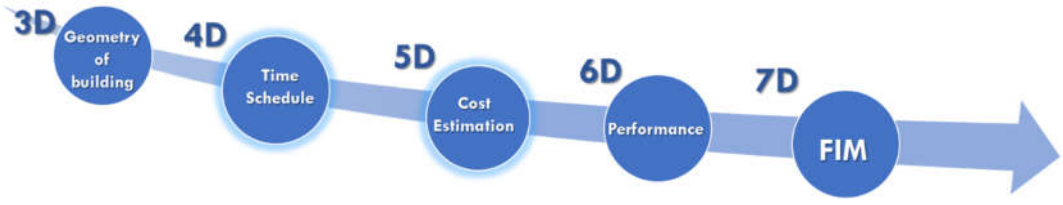
5% DUPLICATED WORK

85% ACCURECY

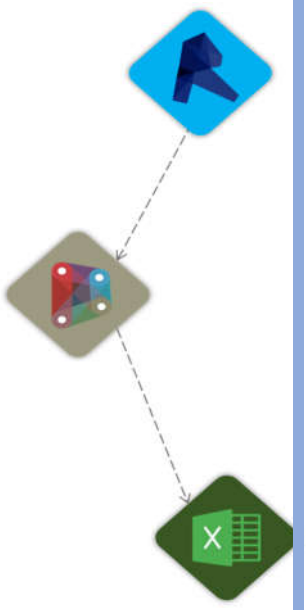
## KPI's

**Another example is in the two areas of the cost estimation and time scheduling.**

The traditional method of Q.S is using the manual calculation software's such as AutoCad. Revit afford a feature of calculating quantities automatically, but the problem is that the revit exporting each schedule of surveyed quantities into an individual ".txt" file for each category, and that's the first issue. The second thing is each of these files will generate a new "xml" file and will over write it , which will consume additional time and efforts in order to claim the generated sheets and insert them in one file then format it , then link it to the time and cost estimation equations, not to mention if something has changed , a new sheet has to be generated and modified again and this takes a lot of effort and time. So, a dynamo script has been created to perform all this process. It has a direct link from Revit to Excel, so that any element to be created or changed or even deleted, the dynamo sends automatically the new schedules to a 1 excel file which include the equations of time and cost estimation (direct cost). This dynamo script reduced time and efforts to reach the 4D and 5D stages

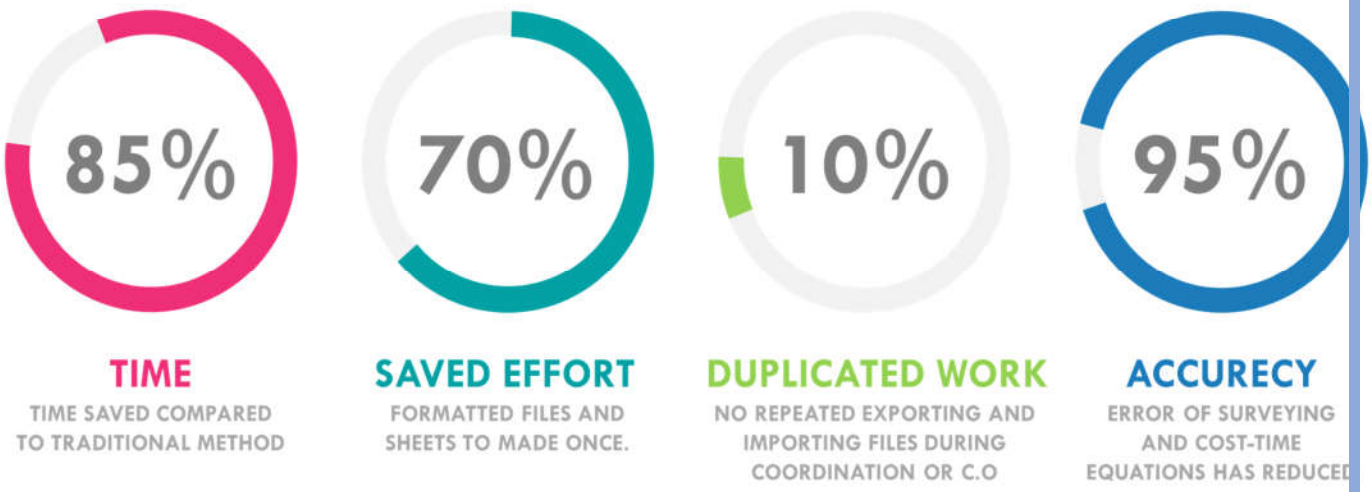


Changes in the model may occur during coordination or owner change order and thus, affect the quantity survey.
A dynamo graph was made to skip the normal steps and keep the data updated without exporting or modifying “txt” and “xml” files after each change.
Dynamo graph link Revit with Excel directly with quantities and time – cost equations which enabled the team to export the data directly to Primavera.
The need of the process is to optimize time and efforts during modeling.



WORK OF A WEEK WILL BE DONE
IN JUST FEW MOMENTS.

PERCENTAGE



# GENERAL STATISTICS

## Programming

**A summary of the features that have been achieved in this project:**

Collaboration reduces the RFI's, with increasing responsibility, motivation and productivity.

Duplicated effort will be reduced.

Visual Clash detection and coordination to be better quality of information

with reduction

The team identified the primary advantage of the BIM as being the specification for the unique and complex roof design.

Good integration between teams.

The involved risk in the project will be reduced.

Applying programming to solve problems or creating smart solutions to meet the tasks outputs as fast as possible is an essential thing specially with a complex and mega project. So, other applications had been applied with programming:

- Creating BOQ by Assembly code
- Creating floor material by room and level
- Creating sheets by plan view
- Creating ID for elements by level or function according to the schedule
- Finishing of wall by rooms and parts.

# GENERAL ACCOMPLISHMENTS

Sum of Many features had been achieved in this project:

- Collaboration reduces the RFI's, with increasing responsibility, motivation and productivity.
- Duplicated effort will be reduced.
- Visual Clash detection and coordination to be better quality of information with reduction
- The team identified the primary advantage of the BIM as being the specification for the unique and complex roof design.
- Good integration between teams.
- The involved risk in the project will be reduced.

Finally, the project has demonstrated that BIM can be implemented at little cost on any sized project and can bring added value, including cost savings. It has also demonstrated that BIM is not merely the adoption of digital technology but is a cultural shift for the organization.

The BIM also aided cultural integration between the team and reduced the adversarial approach that is often found in construction projects. Working from the "same page" allowed any problems to be worked through as a team.

## Purpose

Walking up with technology is very important, some individuals preferred not to try the new ways of working and did not believe on the benefits would be provided by it for the project. The main purpose for the team to this approach was to embrace the new technology, to embrace the long-term benefits and commit the time needed for this program.
For a good collaborative approach, the Revit has allowance system for sets so that a certain layer could only be changed by certain member of the team. As a UTW team were delivering information of design, construction and maintaining of the museum.

## Purpose

The client was pleased with the final product which was brought in on time and with the simulation requirement. This excellent performance was greatly aided by the use of BIM as it enabled effective programming and identification of any clashes in services or components.
The BIM was seen as so successful. And it has been applied in another projects. The use of the 3D model has increased and extended to be used in asset management for the operation stage.
On the Future the Team would provide a full database for the FM service which could be used for maintenance renovation or even demolition.

## Lesson Learnt

BIM development could be hindered by variety of software providers. Software's from different providers do not always interface and exchange data with each other which can lead for interrupting the data exchange and will lead for future mistakes, so that the interoperability and connectivity should be agree as early as possible.